REMARKS

This Amendment and Response is responsive to a non-Final Office Action mailed by the Office on May 19, 2004.

A two-month extension of time for responding to the Office Action is respectfully requested. Filed herewith is a Request for Extension of Time Pursuant to 37 CFR 1.136(a).

The Examiner noted that the information disclosure form (PTO-1449) that was filed on September 27, 2002 was not in the application folder.

The informal drawings were objected to under 37 CFR 1.83(a) for failing to label boxes (222) in Figure 7 as described in the specification.

The disclosure was objected because of inconsistency between the disclosure and the figures with respect to element numbering on page 6 (at lines 8, 9 and 17).

Claims 1-26 were pending in this application. Claims 1-2, 6-7, 10-15 and 18 stand rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over Zimmerman (U.S. Patent No. 5,760,714) in view of Houston *et al.* (U.S. Patent No. 3,921,140).

Claims 3-5 and 19-21 stand rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over Zimmerman in view of Houston *et al.*, and further in view of Hastreiter (U.S. Patent No. 4,667,181).

Claims 8-9 and 16-17 stand rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over Zimmerman in view of Houston *et al.*, and further in view of Valdenaire (U.S. Patent No. 5,677,687).

Claims 23-26 stand rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over Zimmerman in view of Houston *et al.*, and further in view of Feucht *et al.* (U.S. Patent No. 3,689,889). Applicant respectfully traverses Examiner's rejection of the claims.

In the Amendment in the Claims above, Applicants have amended claims 1, 7, 10, 11, 13-19, 21, and 23-25. Applicants have added new claims 27, 28, and 29. After the foregoing amendments, claims 1-29 are pending in this application. The foregoing

amendments are supported in the specification and claims as filed. The foregoing amendments add no new matter.

Reconsideration of the claims is respectfully requested in view of the foregoing amendments and the following remarks.

I.   Information Disclosure Statement

The Office Action stated that the information disclosure form (PTO-1449) that was filed on September 27, 2002 was not in the application folder. Accordingly, Applicants previously submitted a Supplemental Information Disclosure Statement (PTO/SB/08a) on June 21, 2004.

II.   Drawings

The Office Action stated that Figure 7 is objected to under 37 CRF 1.83(a) because it fails to label box (222) as described in the specification. Accordingly, Applicants have submitted amended formal drawings herewith. No new matter has been added.

III.   Specification

Applicants have amended the paragraphs of the specification beginning on page 5, line 18; page 6, line 4; page 6, line 11; and page 11, line 1. The Office Action stated that the specification is objected to because of inconsistency between the disclosure and the figures with respect to element numbering on page 6 (at lines 8, 9 and 17). Accordingly, Applicants have amended the specification to correct the errors identified in the Office Action. No new matter has been added.

IV.   Claims 1-2, 6-7, 10-15, and 18

Applicants have amended claims 1, 7, 11, 13, 14, 15, and 18. Claims 1-2, 6-7, 10-15 and 18 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Zimmerman (U.S. Patent No. 5,760,714) in view of Houston *et al.* To establish a prima

facie case of obviousness, there must be some suggestions or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Further, the prior art reference (or references when combined) must teach or suggest all the claim limitations. See, MPEP 2142. Applicants respectfully assert that Zimmerman in view of Houston *et al.* does not support a prima facie case of obviousness, as is required by MPEP §2142.

In claim 1, as amended, Applicant claims:

A switch matrix circuit comprising:

a plurality of switches organized in a row and column configuration; and

a current sensing circuit coupled to the plurality of switches, the current sensing circuit including a transistor per column of the plurality of switches, and a plurality of resistors each electrically coupled in series with an associated one of the plurality of switches, wherein current amplified by the transistor in a column is sensed as a logic state indicative of a switch status of a switch within the column for a selected row, and wherein the column is configured to conduct at least a threshold current level required for the transistor to perform the amplification if the switch is closed, and to conduct less than the threshold current level if the switch is open, regardless of how many other of the plurality of switches are closed.

Neither Zimmerman nor Houston *et al.* teach or suggest a switch matrix circuit comprising "a current sensing circuit coupled to the plurality of switches, the current sensing circuit including a transistor per column of the plurality of switches, and a plurality of resistors each electrically coupled in series with an associated one of the plurality of switches, wherein current amplified by the transistor in a column is sensed as a logic state indicative of a switch status of a switch within the column for a selected row,

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and wherein the column is configured to conduct at least a threshold current level required for the transistor to perform the amplification if the switch is closed, and to conduct less than the threshold current level if the switch is open, regardless of how many other of the plurality of switches are closed."

Thus, because the cited references fail to teach or suggest all of the claim limitations, Applicants respectfully request that the rejection of claim 1 be withdrawn. Claims 2 and 6 depend on claim 1. Applicants respectfully submit that claims 2 and 6 are allowable for at least the reasons given above in relation to claim 1.

In claim 7, as amended, Applicant claims:

> A circuit for more efficient switch selection sensing, the circuit comprising:
>
> > a switch matrix comprising a plurality of switches organized as a plurality of rows and columns;
> >
> > a current sensing circuit coupled to the switch matrix; and
> >
> > a processor coupled to the switch matrix and the current sensing circuit by a plurality of scan lines, wherein selection of a single row by a scan line returns column current levels from the current sensing circuit to detect if a switch at an intersection of the single row and a column of the switch matrix is closed, and wherein a column current level associated with the column is at least a threshold current level required for detection if the switch is closed, and the column current level associated with the column is less than the threshold current level if the switch is open, regardless of how many other of the plurality of switches are closed.

Neither Zimmerman nor Houston *et al.* teach or suggest a circuit "wherein selection of a single row by a scan line returns column current levels from [a] current sensing circuit ... wherein a column current level ... is at least a threshold current level required for detection [by a processor] if [a] switch is closed," and "is less than the

threshold current level if the switch is open, regardless of how many other of the plurality of switches are closed."

Thus, because the cited references fail to teach or suggest all of the claim limitations, Applicants respectfully request that the rejection of claim 7 be withdrawn. Claims 10-12 depend on claim 7. Applicants respectfully submit that claims 10-12 are allowable for at least the reasons given above in relation to claim 7.

In claim 13, as amended, Applicant claims:

A method for sensing switch statuses, the method comprising:

coupling a current sensing circuit to a switch matrix having a plurality of switches in a row and column configuration comprising one switch per row and column intersection; and

detecting a switch status of a switch within the switch matrix based on whether a current signal in the current sensing circuit comprises at least a threshold current level, regardless of how many other of the plurality of switches are closed.

Neither Zimmerman nor Houston *et al.* teach or suggest a method for sensing switch statuses comprising "detecting a switch status of a switch within the switch matrix based on whether a current signal in the current sensing circuit comprises at least a threshold current level, regardless of how many other of the plurality of switches are closed."

Thus, because the cited references fail to teach or suggest all of the claim limitations, Applicants respectfully request that the rejection of claim 13 be withdrawn. Claims 14, 15, and 18 depend on claim 13. Applicants respectfully submit that claims 14, 15, and 18 are allowable for at least the reasons given above in relation to claim 13.

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V.   Claims 3-5 and 19-21

Applicants have amended claims 19 and 21. Claims 3-5, and 19-21 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Zimmerman in view of Houston *et al.*, and further in view of Hastreiter. Claims 3-5 depend from claim 1. For at least the reasons stated in Section **IV** above, dependent claims 3-5 are allowable as well. Accordingly, Applicant respectfully requests that the Examiner remove the rejection of claims 3-5.

In claim 19, as amended, Applicant claims:

A switch matrix circuit comprising:

a plurality of switches organized in a row and column off-diagonal configuration having one switch per row and column intersection in all but one intersection per row; and

a plurality of bi-directional scan lines, wherein a single bi-directional scan line provides both row selection and column sensing capabilities for switch status identification, wherein:

a first bi-directional scan line of the plurality of bi-directional scan lines is configured to conduct a first signal associated with a first logic state to a selected row of the switch matrix coupled thereto;

a second bi-directional scan line of the plurality of bi-directional scan lines is configured to be scanned for an output signal comprising at least a threshold level, wherein the output signal comprises at least the threshold level only if a scanned switch at an intersection of the selected row and a scanned column of the switch matrix is selected, wherein the scanned column is coupled to the second scan line; and

each of the other bi-directional scan lines of the plurality of bi-directional scan lines is configured to conduct a second signal associated with a second logic state opposite the first logic state.

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Neither Zimmerman, Houston *et al.*, nor Hastreiter teach or suggest a plurality of bi-directional scan lines "wherein: a first bi-directional scan line of the plurality of bi-directional scan lines is configured to conduct a first signal associated with a first logic state to a selected row of the switch matrix coupled thereto; a second bi-directional scan line of the plurality of bi-directional scan lines is configured to be scanned for an output signal comprising at least a threshold level, wherein the output signal comprises at least the threshold level only if a scanned switch at an intersection of the selected row and a scanned column of the switch matrix is selected, wherein the scanned column is coupled to the second scan line; and each of the other bi-directional scan lines of the plurality of bi-directional scan lines is configured to conduct a second signal associated with a second logic state opposite the first logic state."

Thus, because the cited references fail to teach or suggest all of the claim limitations, Applicants respectfully request that the rejection of claim 19 be withdrawn. Claims 20-22 depend on claim 19. Applicants respectfully submit that claims 20-22 are allowable for at least the reasons given above in relation to claim 19.

VI. Claims 8-9 and 16-17

Applicants have amended claims 16 and 17. Claims 8-9, and 16-17 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Zimmerman in view of Houston *et al.*, and further in view of Valdenaire. Claims 8-9 depend from claim 7, and claims 16-17 depend from claim 13. For at least the reasons stated in Section **IV** above, dependent claims 8-9 and 16-17 are allowable as well. Accordingly, Applicant respectfully requests that the Examiner remove the rejection of claims 8-9 and 16-17.

VII. Claims 23-26

Applicants have amended claims 23-25. Claims 23-26 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Zimmerman in view of Houston *et al.*, and further in view of Feucht *et al.*

In claim 23, as amended, Applicant claims:

A circuit for more efficient switch status sensing, the circuit comprising:

a switch matrix including a plurality of switches organized as a
plurality of rows and columns; and

a plurality of resistors, each of the resistors electrically coupled in
series with an associated one of the plurality of switches;

a voltage threshold sensing circuit coupled to the switch matrix by
a plurality of scan lines; and

a processor coupled to the voltage threshold sensing circuit by a
signal bus, wherein selection of a selected row by a scan line returns a
scanned column voltage level from the switch matrix to detect if a switch
at an intersection of the selected row and the scanned column of the switch
matrix has been selected.

Neither Zimmerman, Houston *et al.*, nor Feucht *et al.* teach or suggest a circuit for
more efficient switch sensing "wherein selection of a selected row by a scan line returns a
scanned column voltage level from the switch matrix to detect if a switch at an
intersection of the selected row and the scanned column of [a] switch matrix has been
selected."

Thus, because the cited references fail to teach or suggest all of the claim
limitations, Applicants respectfully request that the rejection of claim 23 be withdrawn.
Claims 24-26 depend on claim 23. Applicants respectfully submit that claims 24-26 are
allowable for at least the reasons given above in relation to claim 23.

VIII.   Prior Art Made of Record and Not Relied Upon

The Office Action cited references in the "Conclusion" section, which were made
of record and not relied upon and that were considered pertinent to Applicant's
disclosure. The Examiner briefly characterized each reference. Applicant respectfully
disagrees with and traverses some of the various findings and description of some of the

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references and whether they are relevant prior art and respectfully reserves the right to present such arguments and other material should the Examiner maintain rejection of Applicants' claims, based upon the references made of record and not relied upon or otherwise.
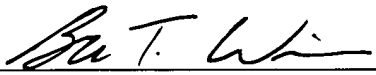
CONCLUSION

All objections and rejections having been addressed, Applicants respectfully submit that all pending claims, 1-29, are allowable. Applicants respectfully solicit the issuance of a Notice of Allowance for all claims.

Should the Examiner have any comments, questions or suggestions of a nature necessary to expedite the prosecution of the application, he is courteously requested to telephone the undersigned at the number listed below.

Respectfully submitted,

Date: 10/19/04

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Attachments